I. C. 7099 FEBRUARY 1940

UNITED STATES
DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, SECRETARY

BUREAU OF MINES
JOHN W. FINCH, DIRECTOR

INFORMATION CIRCULAR

ACCIDENT EXPERIENCE OF FOUR LOUISIANA PETROLEUM REFINERIES, 1929-38

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BY

F. E. CASH AND ERIC H. BROWN

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

ACCIDENT EXPERIENCE OF FOUR LOUISIANA PETROLEUM REFINERIES, 1929-1938[1]

By Frank E. Cash[2] and Eric H. Brown[3]

INTRODUCTION

Accident prevention is an integral part of the operating procedure of the petroleum industry, and refinery officials and employees throughout the United States are exerting concerted effort to reduce the frequency and severity of accidents and are realizing definite results. In other words, the petroleum industry is safety conscious to a much greater degree than most of the other mineral industries.

On January 1, 1938, there were 11 operating refineries in Louisiana with a crude-oil capacity of 199,750 barrels per day.[4] This report deals with safety in four of these refineries representing 72 percent of the refinery capacity of Louisiana.

The accident data, covering the period 1929-38, inclusive, were obtained from four of the operating companies, designated ax plants A, B, C, and D.

To present the 10-year experience, part of the data published in Information Circular 6721[5] is combined with information obtained in a recent survey. These data are published for the information, interest, and benefit of the petroleum industry in Louisiana and in the United States in the furtherance of accident prevention.

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7099."

[2] District engineer, Bureau of Mines Safety Station, Birmingham, Ala.

[3] Senior safety instructor, Bureau of Mines Safety Station, Birmingham, Ala.

[4] Hopkins, G. R., and Seeley, E. M., Natural-Gasoline Plants in the United States, January 1, 1938: Bureau of Mines Inf. Circ. 7031, 1938, 22 pp.

[5] Cash, F. E., Accident Experience of Four Louisiana Petroleum Refineries: Bureau of Mines Inf. Circ. 6721, 1933, 7 pp.

Original from THE OHIO STATE UNIVERSITY

ACKNOWLEDGMENTS

This report was made possible through the cooperation of the four companies and the assistance of their personnel. This cooperation and assistance is acknowledged with appreciation.

ACCIDENT EXPERIENCE

To obtain a true picture of accident experience, it is necessary to consider two phases—frequency and severity.

Frequency is the number of lost-time injuries per million man-hours of exposure.

Severity is the number of days lost as a result of these injuries per thousand man-hours of exposure.

It is essential to know both the frequency and severity of accidents as each accident is potentially a serious one; the seriousness of an accident affects suffering and costs.

Accident frequency and severity rates for the four plants, A, B, C, and D, with the essential data used in obtaining the figures, are given in table 1.

Two of these plants have worked for the 10-year period without a fatal or total permanent disability accident, and one has worked 5 years. Although the total number of lost-time injuries for all four plants varies from year to year, for any one year the frequency is improved compared with the average for the preceding years. The frequency rate for two of these plants is well below that for all major industries, while that for the other two is above the average. The severity rate for the four plants also varies, but the general trend is downward. When compared with the average for the major industries, that for the petroleum industry as a whole is favorable and gratifyingly low.

Plant "C" worked through 1938 with an average of 506 employees working 969,030 man-hours without a lost-time injury.

The accidents are listed in table 2 by months for the 10-year period. The fewest accidents occurred in September, with December second, and February third; the greatest number occurred in March and July, with June a close second. Accidents in these plants appear to happen more frequently in spring and summer than at other times of the year.

The accidents are listed by causes in table 3 and by parts of body injured in table 4.

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TABLE 1.--Accident data, refineries A, B, C, and D, 1929-38

Plant A

Year	Average number of men employed	Exposure, man-hours	Injuries					Total days lost	Frequency	Severity
			Fatal	T.P.	P.P.	Temp.	Total			
1929	4,651	12,186,608	2	0	1	99	102	17,577	8.37	1.44
1930	4,556	12,268,656	1	0	3	69	73	11,152	5.95	.91
1931	3,600	8,674,915	2	0	0	29	31	15,435	3.57	1.78
1932	2,366	5,866,526	1	1	1	11	14	13,040	2.38	2.22
1933	2,426	5,221,784	0	0	0	18	18	1,098	3.44	.21
1934	2,176	5,762,708	1	0	5	19	25	8,844	4.33	1.53
1935	2,186	6,326,017	2	0	2	15	19	15,958	3.00	2.52
1936	2,652	6,809,675	1	1	0	14	16	7,247	2.34	1.06
1937	2,682	6,938,530	0	0	3	15	18	1,495	2.59	.21
1938	2,849	8,039,295	1	0	1	18	20	7,129	2.49	.88
1929-38	3,014	78,094,714	11	2	16	307	336	98,975	4.30	1.26

Plant B

1929	578	1,404,861	0	0	1	108	109	583	77.59	0.41
1930	644	1,317,527	0	0	0	77	77	455	58.44	.35
1931	502	1,165,293	0	0	0	28	28	359	24.03	.31
1932	330	946,571	0	0	0	9	9	90	9.51	.95
1933	330	810,888	0	0	0	17	17	226	20.94	.28
1934	368	912,640	0	0	0	14	14	150	15.34	.17
1935	360	787,543	0	0	0	8	8	54	10.16	.07
1936	360	719,858	0	0	0	6	7	1,886	9.72	2.62
1937	357	641,575	0	0	0	12	12	228	18.84	.38
1938	332	615,992	0	0	0	4	4	152	6.52	.25
1929-38	416	9,322,748	0	0	1	283	285	4,183	30.99	.45

TABLE 1.--Accident data, refineries A, B, C, and D, 1929-38 (Cont'd.)

Plant C

Year	Average number of men employed	Exposure, man-hours	Injuries					Total days lost	Frequency	Severity
			Fatal	T.P.	P.P.	Temp.	Total			
1929	498	1,321,146	0	0	1	65	66	7,496	49.96	5.67
1930	755	2,017,950	1	0	0	1	2	6,026	0.99	2.99
1931	1,256	3,828,090	0	0	0	1	1	10	0.26	.03
1932	411	1,039,836	0	0	0	4	4	146	3.90	.14
1933	461	1,049,264	1	0	0	1	2	6,021	1.91	5.74
1934	508	973,872	0	0	1	3	4	307	4.11	.32
1935	501	961,374	0	0	0	2	2	42	2.08	.04
1936	498	960,018	0	0	1	1	2	235	2.08	.24
1937	509	984,750	0	0	0	2	2	58	2.03	.06
1938	506	969,030	0	0	0	0	0	0	0.00	.00
1929-38	590	14,105,880	2	0	3	80	85	20,341	6.03	1.44

Plant D

1929	74	236,800	0	0	2	24	26	219	109.80	0.93
1930	64	202,240	0	0	1	6	7	86	34.61	.43
1931	43	133,730	0	0	0	2	2	13	14.96	.10
1932[1]										
1933	96	145,000	0	0	0	4	4	58	27.58	.40
1934	93	150,000	0	0	0	2	2	2	13.33	.01
1935	86	170,000	0	0	0	9	9	207	52.94	1.22
1936	93	189,481	0	0	0	5	5	35	26.51	.19
1937	105	230,886	0	0	0	5	5	29	21.64	.12
1938	125	214,332	0	0	0	7	7	205	32.71	.96
1929-38	84	1,672,469	0	0	3	64	67	854	41.87	.51

[1] Data not available.

TABLE 2.--Accidents by months, A, B, C, and D refineries, 1929-38

Month	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Total
January...	26	14	5	2	1	2	4	0	4	6	64
February..	23	11	4	1	1	2	3	2	0	2	49
March.....	37	18	4	4	2	2	1	1	3	5	77
April.....	35	15	5	2	3	1	1	2	3	2	69
May.......	26	11	7	0	7	8	4	2	1	2	68
June......	33	15	5	4	2	3	4	2	4	4	76
July......	26	20	11	1	3	7	1	2	6	0	77
August....	28	13	5	1	3	5	1	2	2	2	62
September.	13	11	4	2	2	2	1	3	2	0	40
October...	17	12	6	3	6	3	1	5	3	0	56
November..	20	11	4	5	3	4	2	4	4	1	58
December..	17	8	2	2	4	4	5	0	0	0	42
"D"1/.....	-	-	-	-	-	2	9	5	5	7	28
Total	301	159	62	27	37	45	37	30	37	31	766

1/ Not given by months, 1934-1938.

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TABLE 3.—Cause of accidents

Cause	Number	Percent
Chemicals and hot substances	120	15.6
Slipping, tripping and stumbling	102	13.3
Dropping objects handled by injured	94	12.3
Flying objects	61	7.9
Falling from height	54	6.9
Explosives and fires	53	6.9
Lifting, pulling and pushing	45	5.8
Hand tools	44	5.7
Falling objects	38	4.9
Moving objects	34	4.4
Running into or striking objects	25	3.2
Machinery	22	2.8
Operation of vehicles	17	2.2
Dropping objects not handled by injured	17	2.2
Fumes	17	2.2
Stepping on objects	12	1.5
Electric shock or burns	7	.9
Heat exhaustion	6	.7
Miscellaneous	4	.5
All causes	772	100.0

TABLE 4.—Parts of body injured

Part of body	Number of accidents	Percent of total
Feet and toes	178	23.1
Eyes	90	11.6
Body	88	11.4
Legs	74	9.6
Face	61	7.9
Ankles	52	6.7
Fingers	50	6.6
Scalp	33	4.3
Hands	33	4.3
Arms	32	4.2
Strains	22	2.8
Knees	21	2.7
Hernia	17	2.2
Internal	13	1.7
Heat exhaustion	5	.6
Gas	3	.3
Total	772	100.0

There was a total of 772 lost-time accidents. Chemicals and hot substances or burns caused the greatest number, 120 (15.6 percent of the total); slipping, tripping, and stumbling came next, with 102 (13.3 percent); dropping objects handled by injured came third, with 94 (12.3 percent); and the other 16 causes were responsible for the remaining 59 percent of the total.

Feet and toes suffered the largest number of accidents, with 178 (23.1 percent); eyes came next, with 90 (11.6 percent); and the body third, with 88 (11.4 percent of the total).

SUMMARY AND CONCLUSION

The refineries in Louisiana have reduced their accident frequency and severity rates materially even though not consistently during the 10-year period, 1929-38.

The frequency according to causes and to parts of the body injured for the 1929-38 period is nearly the same as that published in Information Circular 6721[6], and virtually the same conclusions can be stated. The figures in table 4 unquestionably indicate that if hard-toed (safety) shoes were worn by all employees, if goggles were worn consistently, if leggings were worn for certain types of work, and if more or closer attention were given to proper construction, drainage, walkways, and handling material, many of the slipping, tripping, and stumbling hazards would be eliminated and the Louisiana oil refineries very likely would realize a further reduction in number of accidents.

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[6] See footnote 5.